1970 OPERATING SUMMARY

GODERICH water treatment plant

ONTARIO WATER RESOURCES COMMISSION

Division of Plant Operations

Water management in Ontario

Ontario
Water Resources
Commission

135 St. Clair Ave. W.
Toronto 195
Ontario

Once again we have the privilege of submitting to you our latest detailed report on financial progress and technical activity at your water treatment plant.

The statistical information contained in this annual operating summary will undoubtedly be a useful barometer of efficiency. Of particular interest will be the comments and recommendations of the regional operations engineer, who was intimately connected with day-to-day operation throughout 1970.

Together with the extensive cost data provided, this information should assist greatly in your general understanding of the problems met and dealt with, and in furnishing a yardstick for possible future expansion.

D. S. Caverly,
General Manager.

D. A. McTavish, P. Eng.,
Director,
Division of Plant Operations.

CONTENTS

GODERICH

water treatment plant

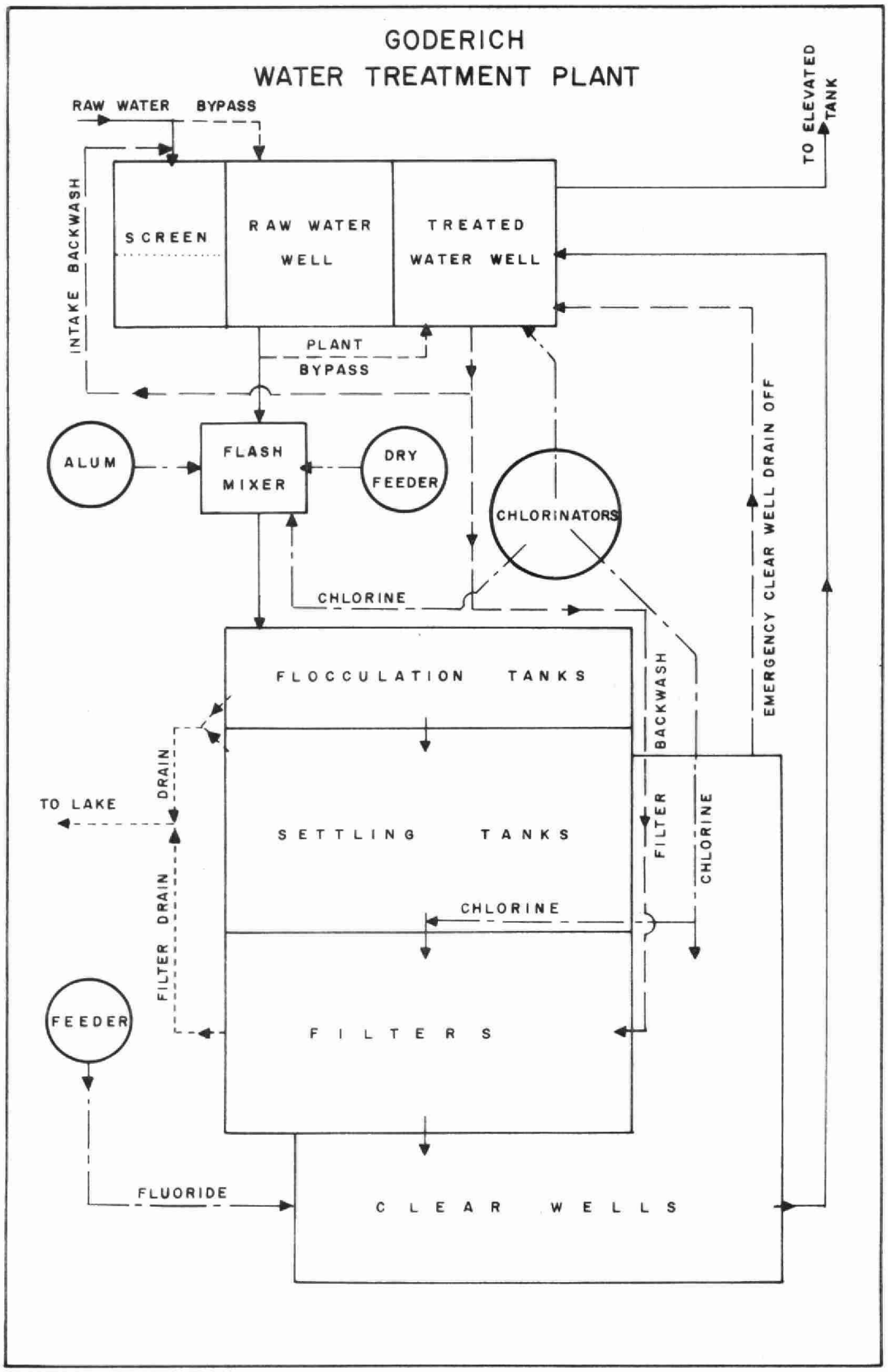
operated for

THE TOWN OF GODERICH

by the

ONTARIO WATER RESOURCES COMMISSION

1970 ANNUAL OPERATING SUMMARY


GODERICH
WATER TREATMENT PLANT
RAW WATER
BYPASS
TO ELEVATED TANK
INTAKE BACKWASH
SCREEN
RAW WATER WELL
TREATED WATER WELL
PLANT BYPASS
ALUM
FLASH MIXER
DRY FEEDER
CHLORINATORS
EMERGENCY CLEAR WELL DRAIN OFF
CHLORINE
FLOCCULATION TANKS
BACKWASH
DRAIN
TO LAKE
SETTLING TANKS
FILTER
CHLORINE
CHLORINE
FILTER DRAIN
FEEDER
F I L T E R S
FLUORIDE
C L E A R W E L L S

DESIGN DATA

NOMINAL CAPACITY

1.5 mgd

RAW WATER SOURCE

Lake Huron

INTAKE

Rock-filled timber crib with cover plate
Min. water depth -
above bellmouth 15.25'
above crib 13.00'

Pipe: 1600 ft of 30" dia concrete

SCREENING

Type: Link-Belt travelling screen
3/8" opening
Size: One 3' wide x 23' deep - speed 10 mg/l

FLASH MIXING

Chamber Size: One 7.67' x 7.67' x 8.50'
Volume: 500 ft^2 or 3125 gal
Detention: 3.1 min @ 1.5 mgd
Mixer: "Lightnin" with 30" dia propeller
84 rpm

FLOCCULATION

Stuart-Carter walking beam flocculator mechanism
Tank Size: Two 14.5' x 20.5' x 15.7' deep
Total Volume: 9340 ft^3 or 58,400 gal
Detention: 56 min @ 1.5 mgd

SEDIMENTATION

Size: Two 61.5' x 20.5' x 7.5' deep
Volume: 19,100 ft^3 or 120,000 gal
Detention: 1.9 hr @ 1.5 mgd
Overflow: 590 gpd/ft^2

FILTRATION

Type: Gravity sand filter - 24" sand 0.5-0.55 min
Size: Four 12' x 12'
Rate: 1.8 igpm/ft^2 @ 1.5 mgd
Backwash: 3470 gpm (imp)

CHLORINATION

One W & T 100 lb/day (prechlorination)
One W&T 10 lb/day (post chlorination)
One W&T 100 lb/day (standby)

STORAGE

Clear Wells - 24,000 gal
Reservoir - 91,400 gal
Town elevated tank - 200,000 gal
O.H. elevated tank - 250,000 gal

CAPACITY OF UNITS

Intake - 6.4 mgd @ 2.44 fps
Low Lift Pumps #1 pump 0.95 mgd @ 6.7' head
#2 pump 1.60 mgd @ 6.7' head
#3 pump 1.60 mgd @ 6.7' head
Combined #1 & 2 or 3 - 2.55 mgd @ 6.7' head
Filters @ 1.8 gpm, 1.49 mgd

HIGH LIFT PUMPS

#4 pump 0.75 mgd @ 315' head
#5 pump 1.25 mgd @ 315' head
#6 pump 1.25 mgd @ 315' head
Combined #4 & 5 or 6 2.00 mgd

'70 REVIEW

FLOWS	DAILY FLOW mil gal	OCCURRING IN THE MONTH OF	MONTHLY FLOW mil gal	OCCURRING IN THE MONTH OF
Average	0.83	—	306.10	—
High	1.21	June	38.05	August
Low	0.63	March	18.55	February

RESUME

The average daily flow of 0.83 mgd was equal to 55% of the design flow of 1.5 mgd. The plant design flow was exceeded during the months of June and July of 1970.

The total plant output in 1970 was 306.10 million gallons at a total operating cost of $64,044.50, an increase of $4,577.01 from the previous year. Despite this increase, the unit costs of 21 cents for treating 1,000 gallons of water remained the same as that of 1969.

GENERAL

The Goderich Water Treatment System, consists of a 1.5 mgd water treatment plant complete with low lift pumps, flash mixing, flocculation, sedimentation, gravity sand filters, chemical feeders, chlorination, fluoridation, high lift pumps, reservoir, and elevated tank and providing water to the Town of Goderich and the Ontario Hospital.

The system is operated by a permanent staff of four operators, one casual, plus the chief operator Mr. M. E. Wilkinson. Staff coverage is provided 24 hours per day, seven days per week with each man working an average of 40 hours per week.

The staff maintained a clean, attractive and efficient plant for the Town of Goderich, during 1970. No major operational problems, mechanical or electrical failures were noted during the year.

Further progress was made towards alteration of the plant. Using Reserve Expenditures and the engineering completed by the Ontario Water Resources Commission (Divisions of Research and Plant Operations) the treatment plant capacity will be increased to at least 2.0 mgd with the modification of existing filters, flocculation tank, and associated appurtenances.

PLANT FLOWS

The average daily demands were high from May to September with the maximum of 1.21 mg occurring in June. Low flows occurred during the months of January to April, with the yearly daily average being 0.83 mg and a minimum occurring in March, of 0.63 mg.

PROCESS CHEMICALS

A total of 1,472.7 gallons of alum was used on 79 days as a coagulant in the operation of the clarifier. Dosage rates of the solution ranged from 9 to 24 mg/l and averaged 19.9 mg/l.

The total amount of chlorine used was 3,327.6 lbs. which averaged to a prechlorination dosage of 0.97 mg/l. An average dosage of 0.08 mg/l was used in post-chlorination to maintain a residual of 0.4 mg/l in the treated water pumped to the distribution system.

To maintain a fluoride residual of 0.89 mg/l in 1970, 2,806.8 lbs. of sodium silicofluoride was used. During the month of December there was no sodium silicofluoride added as the feeder was inoperative due to minor mechanical problems.

WATER QUALITY

The average hardness of the water was 109 mg/l as $CaCO_3$ (122 mg/l). This is considered to be a hard water. Hardness is not changed by the treatment process now in use.

The alkalinity averaged 91 mg/l as $CaCO_3$ (98 mg/l). The iron content remained approximately the same as the previous year, 0.11 mg/l as Fe (0.12 mg/l) but still below the recommended limit of 0.3 mg/l. The colour averaged 6 units, slightly above the recommended upper limits of 5 units. The treated water chloride content averaged far well within the recommended limit. The fluoride content in the treated water was well within the desirable limits.

Two hundred and fifty four bacteriological samples of the raw, treated and distribution system water were taken during the year. In the raw water bacteriological samples, the geometric mean averaged 3.5 coliform per 100 ml. During the year there were no bacti counts in the treated water supply.

CONCLUSIONS

Although the maximum daily flows were sometimes above the rated capacity of the plant during the summer months, fortunately, there was no difficulty in supply an adequate volume of treated water to the distribution system.

These high demands were experienced despite existing water restrictions in the Town of Goderich. The OWRC recommendations for alterations to the treatment plant are expected to be finished in 1971 thereby increasing the plant's capacity to at least 2.0 mgd. With these alterations to the plant, the treated water colour and turbidity is expected to improve significantly to within the desirable standards.

The treated water remained at a high quality level during the year.

NET CAPITAL COST (Final)

Goderich Town	$1,001,579.07		
Deduct payments from municipality	308,383.05	$693,196.02	
Ontario Hospital	-		
Deduct payments from Ontario Hospital	-		
Long Term Debt to OWRC			$693,196.02
Debt Retirement Balance at Credit (Sinking Fund) December 31, 1969:			
Goderich Town		$142,344.13	
Ontario Hospital		-	$142,344.13

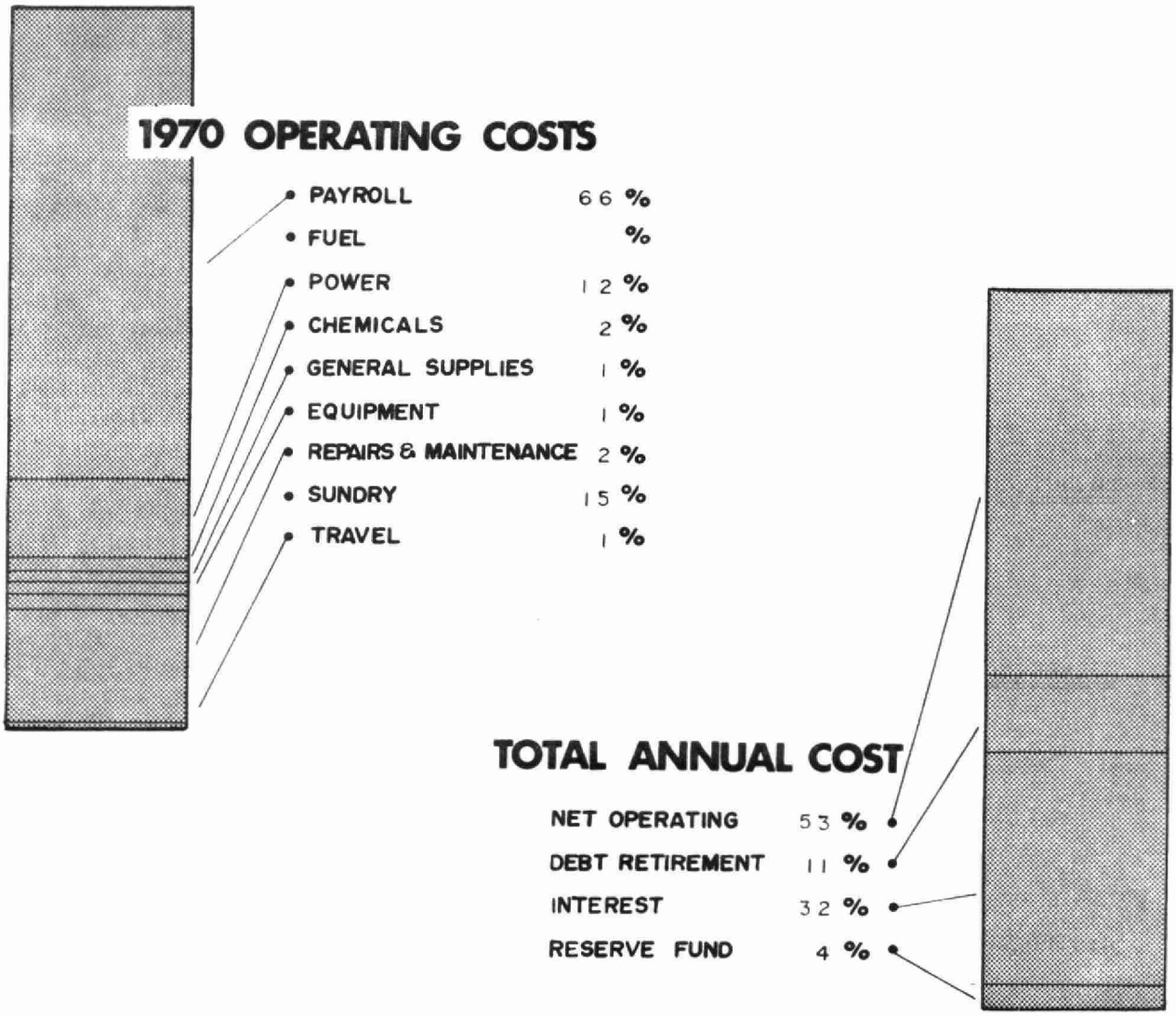
BILLINGS

The total cost to the municipality during 1970 was as follows:

Net Operating		
Goderich Town	$ 60,803.50	
Ontario Hospital	3,240.63	$ 64,041.13
Debt Retirement		
Goderich Town	$ 13,988.00	
Ontario Hospital	-	$ 13,988.00
Reserve		
Goderich Town	$ 4,163.26	
Ontario Hospital	245.62	$ 4,408.88
Interest Charged		
Goderich Town	$ 38,837.15	
Ontario Hospital	-	$ 38,837.15
TOTAL		$121,275.16

RESERVE ACCOUNT

	Total	Ontario Hospital	Town of Goderich
Balance at January 1, 1970	$44,612.51	$2,833.28	$41,779.23
Add: Payments in 1970	4,408.88	245.62	4,163.26
	$49,021.39	$3,078.90	$45,942.49
Add: Interest earned on Reserve funds in 1970	3,041.22	192.33	2,848.89
	$52,062.61	$3,271.23	$48,791.38
Less Expenditures	-	-	-
Balance at December 31, 1970	$52,062.61	$3,271.23	$48,791.38



Yearly Operating Costs

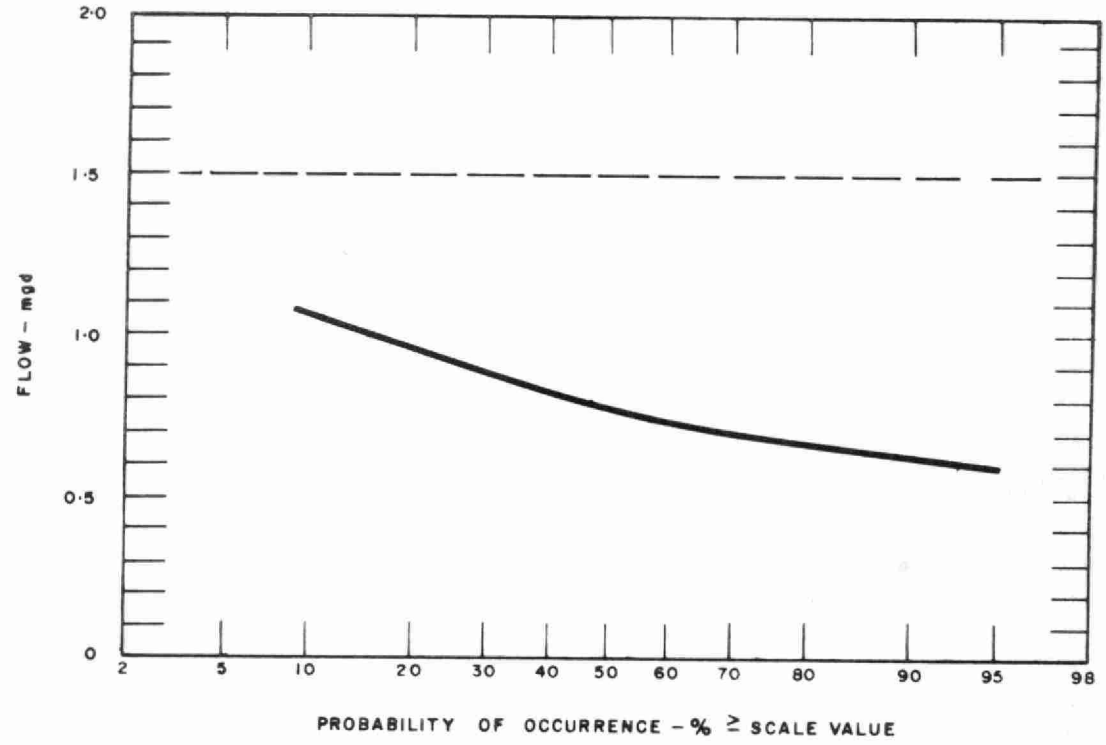
YEAR	MILLION GALLONS TREATED	TOTAL OPERATING COSTS	COST PER THOUSAND GALLONS
1966	270.556	$44,799.00	17 cents
1967	235.314	47,492.00	20 cents
1968	252.91	53,844.00	20 cents
1969	286.29	59,477.74	21 cents
1970	306.10	64,041.65	21 cents

MONTHLY OPERATING COSTS

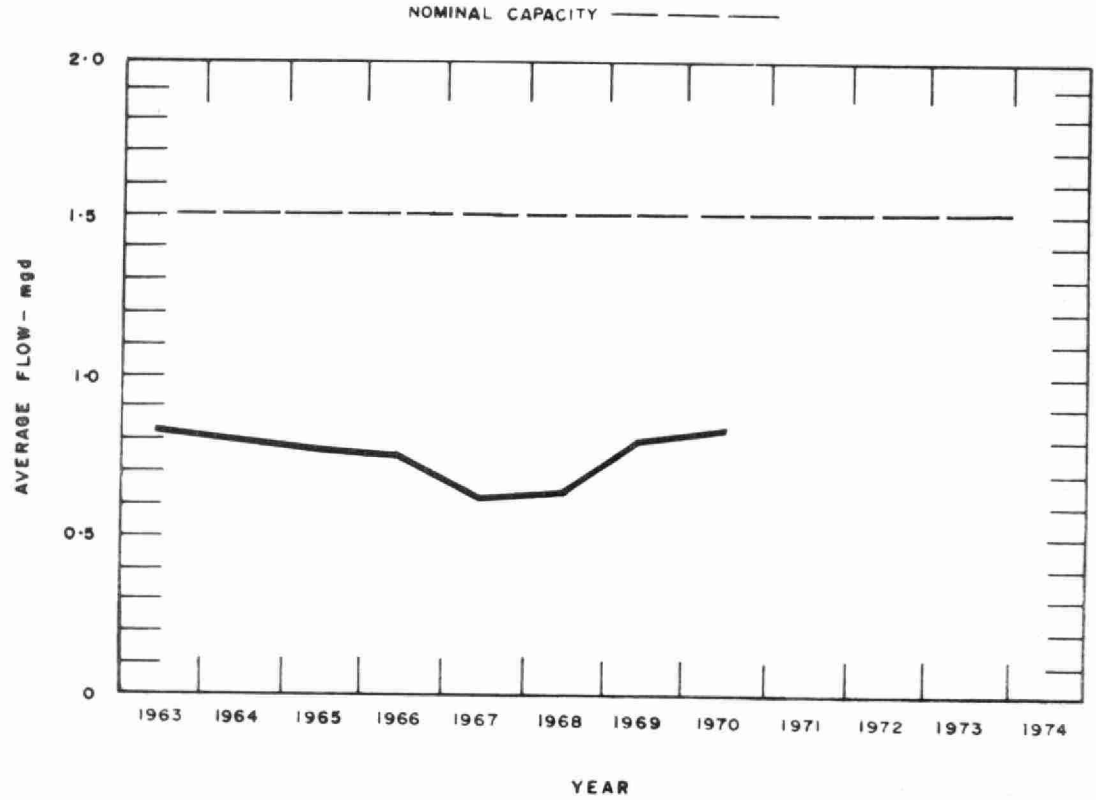
MONTH	TOTAL EXPENDITURE	PAYROLL	CASUAL PAYROLL	FUEL	POWER	CHEMICALS	GENERAL SUPPLIES	EQUIPMENT	REPAIRS and MAINTENANCE	SUNDRY	TRAVEL
JAN	5546.07	4363.00	278.91	-	682.60	-	35.02	-	137.25	26.49	22.80
FEB	4332.60	2960.22	338.69	-	785.20	-	95.65	49.03	70.28	15.83	17.70
MAR	3977.38	2949.92	333.09	-	625.00	-	30.55	-	-	17.67	21.15
APR	3850.41	2910.83	243.94	-	595.20	-	58.28	-	-	21.16	21.00
MAY	4490.51	3309.98	243.94	-	584.00	-	26.12	136.50	-	18.03	171.94
JUNE	4209.99	2955.16	110.21	-	603.40	88.00	55.25	160.15	23.52	186.35	27.95
JULY	13228.88	2866.23	677.18	-	757.60	780.37	104.60	6.08	146.58	7863.24	27.00
AUG	5759.87	4439.79	554.77	-	699.80	-	-	-	-	42.41	23.10
SEPT	4964.66	2905.32	288.21	-	688.00	-	155.34	-	-	899.44	28.35
OCT	4336.28	2887.89	333.09	-	598.20	12.10	96.38	-	20.89	257.53	130.20
NOV	4416.50	2918.00	221.65	-	584.65	389.30	120.82	37.67	82.74	39.32	22.35
DEC	4928.50	2874.15	221.65	-	579.05	41.47	161.77	28.97	979.33	19.46	22.65
TOTAL	64041.65	38340.49	3845.33	-	7782.70	1311.24	939.78	418.40	1460.59	9406.93	536.19

BRACKETS INDICATE CREDIT

Note: Total does not include year end adjustments.

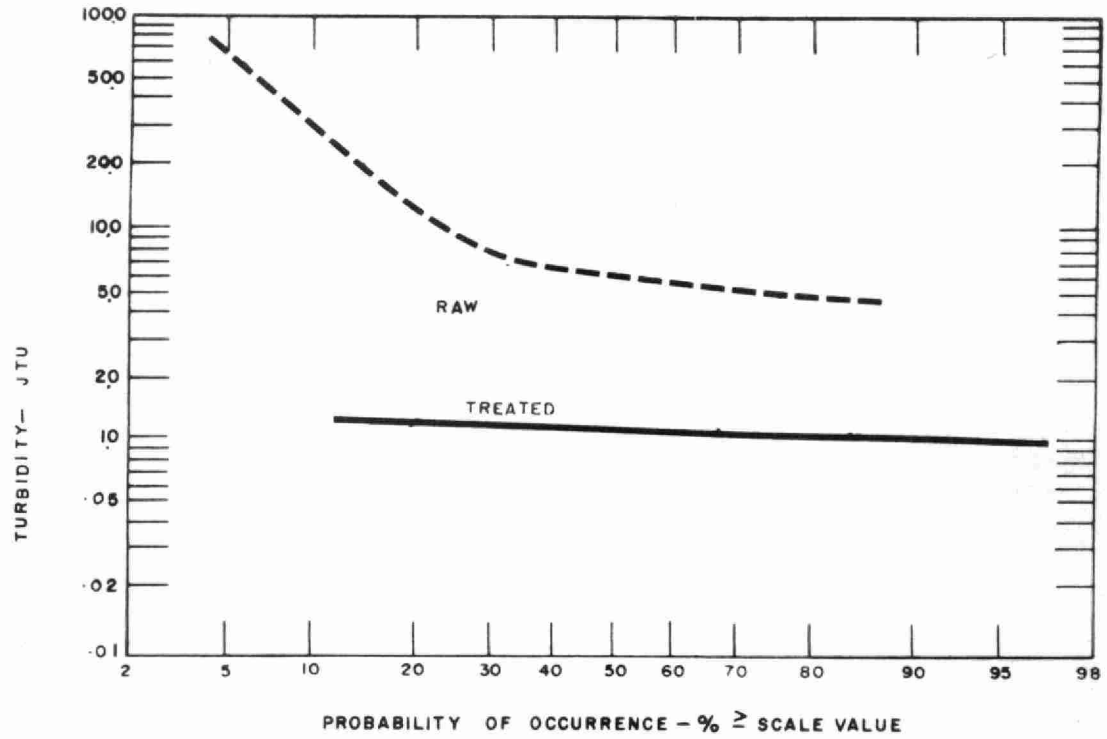

2·0
1·5
1·0
0·5
0
FLOW - mgd
2
5
10
20
30
40
50
60
70
80
90
95
98
PROBABILITY OF OCCURRENCE - % ≥ SCALE VALUE

FLOWS

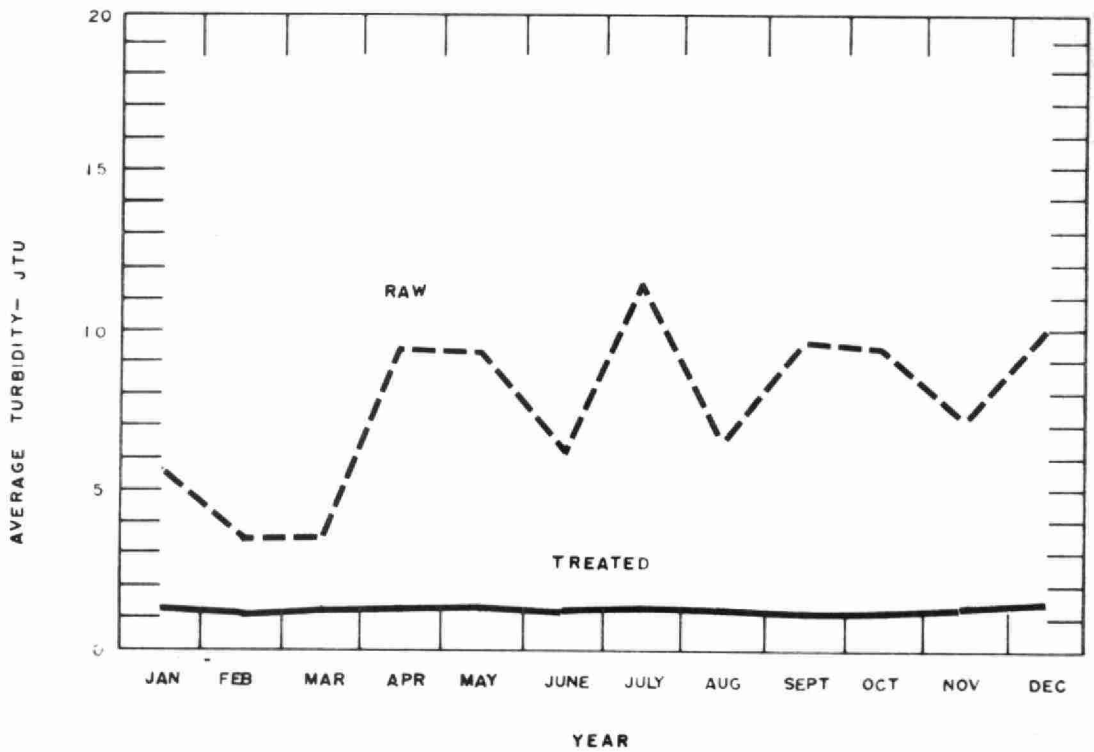

NOMINAL CAPACITY
2·0
1·5
1·0
0·5
0
AVERAGE FLOW - mgd
1963
1964
1965
1966
1967
1968
1969
1970
1971
1972
1973
1974
YEAR

PLANT FLOWS

MONTH	TOTAL PLANT OUTPUT mil gal	AVERAGE DAILY FLOW mil gal	MAXIMUM RATE mgd	MAXIMUM DAILY FLOW mil gal	MAXIMUM 3-DAYS' FLOW mgd
JANUARY	21.02	0.68	1.6	0.89	0.81
FEBRUARY	18.55	0.66	1.6	0.82	0.76
MARCH	19.47	0.63	1.0	0.80	0.73
APRIL	19.93	0.66	1.0	0.84	0.82
MAY	24.70	0.82	1.7	1.10	0.96
JUNE	37.41	1.21	2.3	1.95	1.87
JULY	28.69	0.94	2.6	1.26	1.09
AUGUST	38.05	1.18	2.6	1.68	1.65
SEPTEMBER	25.63	0.85	1.8	1.02	0.95
OCTOBER	25.12	0.81	1.8	0.95	0.91
NOVEMBER	24.32	0.81	1.8	0.93	0.84
DECEMBER	23.21	0.75	1.6	0.90	0.84
TOTAL	306.10				
AVERAGE		0.83	(MAXIMUM VALUES FOR THE YEAR) 2.6	1.95	1.87


1000
500
200
100
50
20
10
.05
.02
.01
TURBIDITY— JTU
RAW
TREATED
2
5
10
20
30
40
50
60
70
80
90
95
98
PROBABILITY OF OCCURRENCE – % ≥ SCALE VALUE

TURBIDITY


20
15
10
5
0
AVERAGE TURBIDITY— JTU
RAW
TREATED
JAN
FEB
MAR
APR
MAY
JUNE
JULY
AUG
SEPT
OCT
NOV
DEC
YEAR

TURBIDITY

The turbidity of water is a measure of the interference presented by suspended matter such as clay, silt, finely divided organic matter and microscopic organisms present in the water. The OWRC standard for turbidity in treated water is 1 Jackson Turbidity Unit (JTU).

Turbidity in the raw water was greater than 10 JTU 25% of the time during the year, with an average of 7.7 and a maximum of 100 while the average monthly maximum was 11.5 JTU's. Turbidity of the clear water varied from 1.0 to 1.5 JTU with the average being 1.2 JTU's.

The raw water turbidity was often higher than normally expected because the plant's intake chamber in Lake Huron is between the mouth of the Maitland River and the outfall of the sewage treatment plant, and also due to the shallowness of Lake Huron in this vicinity.

CHLORINATION and DISINFECTION

MONTH	RAW WATER					PLANT EFFLUENT		DISTRIBUTION SYSTEM		CHLORINATION			
	NUMBER OF SAMPLES WITH COLIFORMS PER 100 ml OF:					No. of Samples Taken	No. with Coliform Organisms	No. of Samples Taken	No. with Coliform Organisms	CHLORINE USED lb	DOSAGE pre- mg/l	DOSAGE post mg/l	RESIDUAL in Plt. Eff. mg/l
	0	1 - 4	4 - 32	32-320	> 320								
JAN	2	1	0	0	0	3	0	13	0	189.9	.83	.05	.4
FEB	2	1	1	0	0	5	0	13	0	159.3	.76	.08	.3
MAR	2	0	2	1	0	7	0	16	0	145.0	.68	.06	.3
APR	0	0	1	2	0	4	0	10	0	235.4	1.00	.11	.4
MAY	2	1	0	0	0	2	0	14	0	280.8	1.00	.11	.5
JUNE	2	0	0	0	0	6	0	10	0	398.2	.98	.05	.5
JULY	0	1	2	0	0	3	0	11	0	296.1	1.04	.07	.4
AUG	0	3	0	0	1	5	0	20	0	421.0	1.08	.08	.4
SEPT	0	2	1	0	0	4	0	14	0	328.0	1.14	.07	.5
OCT	1	1	1	0	0	3	0	11	0	299.3	1.05	.08	.5
NOV	0	1	3	1	0	7	0	15	0	278.3	1.02	.09	.5
DEC	1	2	1	0	0	5	0	13	0	296.3	1.03	.08	.6
TOTAL						54	0	160	0	3327.6			
AVERAGE	(NOTE: Geometric Mean) 3.5 Coliforms/100 ml										.97	.08	.4

CHEMICAL CHARACTERISTICS

PROPERTY	RAW WATER				PLANT EFFLUENT				DESIRABLE STANDARDS
	Number of Samples	Average	Maximum	Minimum	Number of Samples	Average	Maximum	Minimum	
HARDNESS mg/l as $CaCO_3$	18	142	492	96	21	109	176	100	80 – 100
ALKALINITY mg/l as $CaCO_3$	18	109	206	78	21	91	133	74	30 – 100
IRON mg/l Fe	18	.65	4.0	.05	19	.12	.45	.005	< 0.3
CHLORIDE mg/l Cl^-	18	13	66	8	21	13	24	8	< 250
pH units	18	8.2	8.5	73	21	7.9	8.9	7.3	
FLOURIDE mg/l F	13	0.3	0.7	0.1	16	.8	1.0	.1	0·8 – 1·2

CHEMICALS USED

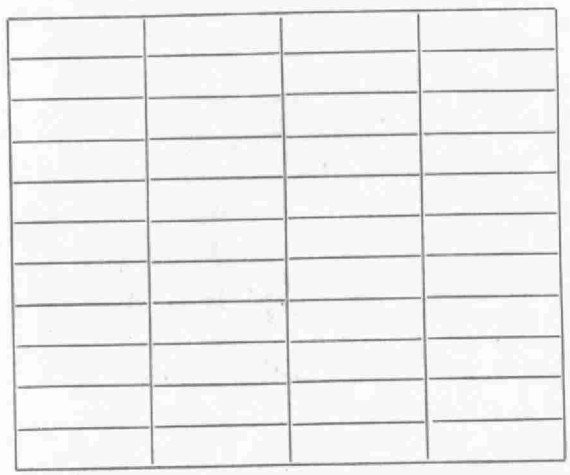
MONTH	Alum as $Al_2(SO_4)_3 \cdot 13H_2O$			FLOURIDE			
	No. of days used	Dosage mg/l	Liquid Alum gal.	Sodium Silico-Flouride used lb.	Concentration mg/l: AVG	MAX	MIN
JANUARY	3	9.0	14.1	287.5	.99	1.05	.95
FEBRUARY	0	0	0	249.0	1.01	1.10	.95
MARCH	0	0	0	229.5	.99	1.05	.90
APRIL	17	17.0	276.2	222.5	.96	1.00	.85
MAY	10	23.8	191.3	288.5	.98	1.29	.85
JUNE	28	21.9	802.8	385.5	.94	1.29	.88
JULY	12	24.0	122.6	263.8	.78	1.20	.50
AUGUST	9	23.7	65.7	315.0	.81	1.11	.54
SEPTEMBER	0	0	0	192.0	.75	1.04	.49
OCTOBER	0	0	0	256.0	.93	1.88	.75
NOVEMBER	0	0	0	117.5	.64	1.60	.67
DECEMBER	0	0	0	0	-	-	-
TOTAL	79	-	1472.7	2806.8	-	-	-
AVERAGE	-	19.9	-	-	.89	-	-

FILTER OPERATION

MONTH	TURBIDITY - in J.T.U.				FILTER RUN		FILTER RATE		FILTER WASH
	APPLIED		EFFLUENT		AVERAGE	MINIMUM	AVERAGE	MAXIMUM	% of plant
	AVG.	MAX.	AVG.	MAX.	hours	hours	gpm/ft^2	gpm/ft^2	output
JAN	3.5	7.0	1.2	1.3	30	29	1.83	2.36	2.6
FEB	2.9	5.0	1.1	1.2	32	29	1.76	2.36	2.7
MAR	3.0	4.0	1.2	1.3	31	29	1.84	2.36	2.6
APR	3.7	38.0	1.3	1.3	30	29	1.88	2.41	3.4
MAY	4.0	11.0	1.2	1.4	29	24	1.85	2.41	2.6
JUNE	3.1	8.0	1.1	1.4	15	10	2.70	3.08	3.9
JULY	3.8	28.0	1.2	1.5	31	21	2.23	3.00	2.5
AUG	4.3	100.0	1.2	1.5	38	22	2.50	3.08	1.6
SEPT	3.5	35.0	1.1	1.3	36	27	2.03	2.41	2.2
OCT	3.1	40.0	1.0	1.2	35	22	1.96	2.41	2.3
NOV	4.4	80.0	1.1	1.3	36	22	1.78	2.41	2.3
DEC	5.8	100.0	1.2	1.3	40	37	1.80	2.41	1.9
AVERAGE	38		1.2		32		2.01		2.6
		100.0		1.5		10		3.08	

PHYSICAL CHARACTERISTICS

MONTH	TURBIDITY Jackson Turbidity Units		COLOUR Apparent Colour Units		TEMPERATURE Fahrenheit Degrees	
	RAW WATER	PLANT EFFLUENT	RAW WATER	PLANT EFFLUENT	AVERAGE	MAXIMUM
JANUARY	5.7	1.2	5	5	33	33
FEBRUARY	3.4	1.1	5	5	33	33
MARCH	3.6	1.2	5	5	33	33
APRIL	9.7	1.3	-	15	37	49
MAY	9.4	1.2	10	8	51	57
JUNE	6.4	1.1	15	5	57	63
JULY	11.5	1.2	-	-	65	68
AUGUST	6.5	1.2	8	-	70	75
SEPTEMBER	9.8	1.1	5	5	64	70
OCTOBER	9.4	1.0	5	5	56	64
NOVEMBER	7.3	1.1	-	5	45	50
DECEMBER	10.0	1.2	120	5	35	38
AVERAGE	7.7	1.2	20	6	48	
MAXIMUM	11.5	1.3	120	15		75



Water management in Ontario